

# A Reclassification of the Fern Genus *Pyrrosia*<sup>1</sup>

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The name *Pyrrosia*, although published by Mirbel in 1803, was overlooked by pteridologists until relatively recently. Instead, the synonyms *Cyclophorus* Desv., 1811, or *Niphobolus* Kaulf., 1824, were used. Giesenhagen (1901) published the only monograph, treating 50 species in *Niphobolus* and describing their venation, epidermis, and indument. Farwell (1931, pp. 241–246) recognized that *Pyrrosia* is the correct name of the genus. R. C. Ching (1935) studied the species of the Asian mainland, Japan, and Taiwan Province of China. He transferred 49 known species to *Pyrrosia* and described five new species. This has been the only extensive systematic paper on the genus. Nayar and others (1961, 1965, 1967) did detailed work on the morphology and anatomy of the Indian species of *Pyrrosia* in which they divided the 13 Indian species into six groups, some of which are apparently unnatural and inconvenient to use. For example, they placed *P. lingua* (Thunb.) Farw., which has stellate hairs with only lanceolate arms in the *P. heteractis* group, although each stellate hair of *P. heteractis* (Mett. ex Kuhn) Ching has 1–3 longer, acicular arms in addition to the lanceolate arms. Van Alderwerelt van Rosenberg (1908, pp. 678–696) divided 34 Malesian species into two sections under the generic name *Cyclophorus*. Section *Niphobolus* had venation similar to that of *Campyloneurum* (more or less regular, subquadrangular areolae with two or more simple or forked, included, extrorse veinlets). Section *Niphopsis* had venation similar to that of *Pleopeltis* (more or less irregularly netted with single, free, included, variously oriented veinlets). This arrangement has something to recommend it, but since the blade of *Pyrrosia* is very thick and in most species the veins cannot be seen without clearing, venation is difficult to use for identifications.

In China, *Pyrrosia* is an herb of traditional use. Since the laminae are shaped like a dagger with a leathery texture and usually trail on rocks, it was called "Rocky Leather" or "Flying Dagger" in old Chinese herbals. It is a diuretic which can be used to clean the lungs and to alleviate fever. Now in the pharmacy there are two kinds of medicine on the market, "Shiwei Tablet" and "Instant Shiwei Powder" (Shiwei in Chinese means *Pyrrosia*), made from *Pyrrosia* plants and said to have curative effects for nephritis and chronic tracheitis. Since special care is unnecessary for the survival of these plants, except for good drainage, they may be cultivated in pots, on tree trunks, on rocks, or even on the ground. The evergreen fronds with many sori covered with white or light brown, stellate hairs give them a nice appearance, and plants have been introduced into many countries for use in gardens or homes as ornamental plants. As commercial ferns, they compare favorably with Boston Fern (*Nephrolepis*) or Goldback Fern (*Pityrogramma*). In the last few years,

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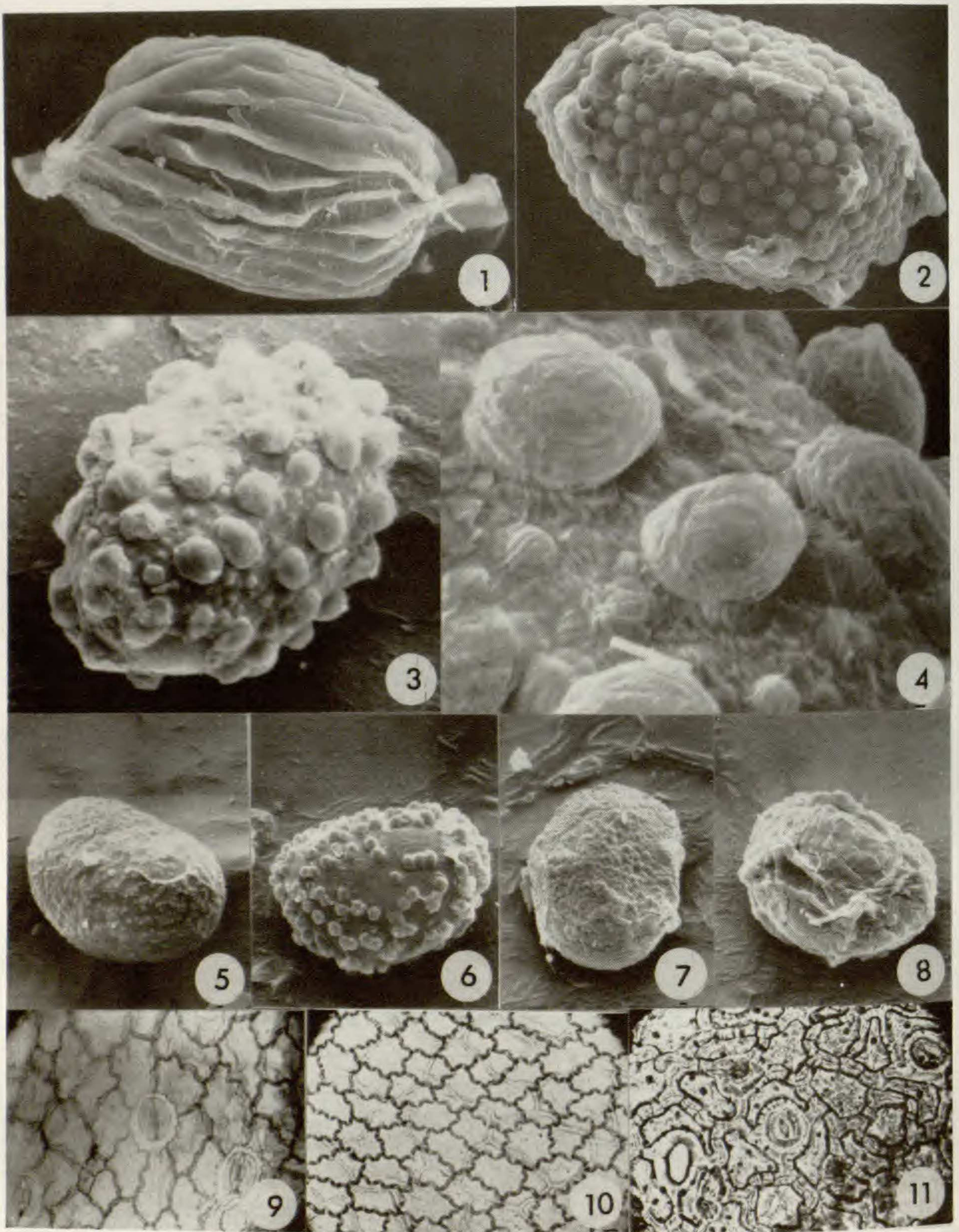


FIG. 1. Spore of *Pyrrrosia angustata*,  $\times 1300$  (Sumatra, *H. F. Sun* in 1939, PE). FIG. 2. Spore of *P. macrocarpa*,  $\times 1000$  (Raivavae, *St. John et al.* 15828, GH). FIG. 3. Spore of *P. adnascens*,  $\times 1300$  (Hainan, *Shing et al.* 1567, PE). FIG. 4. Same, detail,  $\times 4000$ . FIG. 5. Spore of *P. davidii*,  $\times 1100$  (Hopei, *K. M. Liou* 3065, PE). FIG. 6. Spore of *P. eberhardtii*,  $\times 1200$  (Hainan, *K. L. Zuo* 43987, PE). FIG. 7. Spore of *P. polydactylis*,  $\times 1200$  (Taiwan, *Tanaka* 140, PE). FIG. 8. Spore of *P. borneensis*,  $\times 1100$  (Borneo, *H. F. Sun* 198, PE). FIG. 9. Lower epidermis of *P. clavata*. FIG. 10. Upper epidermis of *P. clavata*. FIG. 11. Lower epidermis of *P. angustata*.

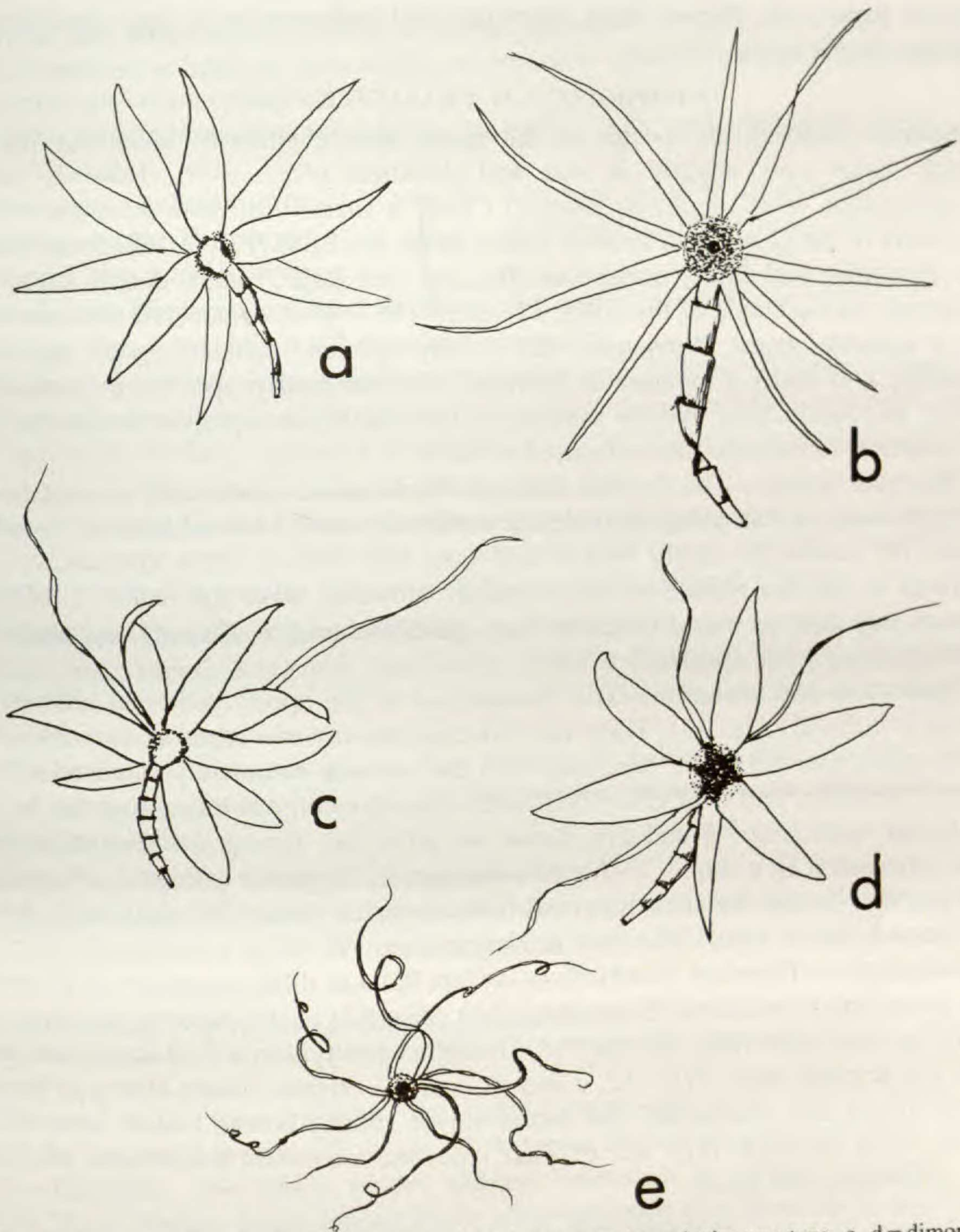


FIG. 12. Types of stellate hairs in *Pyrrosia*. a = broad arm type, b = acicular arm type, c, d = dimorphic arm types, e = crisate-lanose arm type.

a number of *Pyrrosia* species have been imported into the United States from the East Indies, the Philippines, Japan, and New Guinea (Hoshizaki, 1981).

*Pyrrosia* includes about 100 species, mostly in Asia, with a few in Australia, New Zealand, Oceania, and Africa. Fifty species occur in China. Because of their more or less uniform appearance, identification may be quite difficult. During the past several years, the writer has observed their spore morphology, epidermises, stomata, and indument, and has tried to establish their taxonomic relationships. The

present paper will discuss these characters and will propose a new classification scheme for the genus.

### MORPHOLOGICAL CHARACTERISTICS

**Spores.**—Almost all species of the genus have a uniform, tubercular perine, which varies only slightly in size and thickness (*Figs. 2–8*). However, spore ornamentation of *P. angustata* (Swartz) Ching is sharply different from most other members of the genus, and appears ribbed under the SEM (*Fig. 1*). Since the fronds are dimorphic and firmly coriaceous, the sori very large, round, deeply sunk, and uniseriate on each side of the costa, J. Smith (1857, p. 6) considered this species to be a separate genus, *Niphopsis*. But in my opinion, considering all important features, it is really a member of *Pyrrosia*. Another similar species, *P. samarensis* (Mett. ex Presl) Ching, has the same spore ornamentation. I propose to use the rank of subgenus to indicate their advanced position in *Pyrrosia*.

**Rhizome scales.**—The rhizome scales of *Pyrrosia* are either entire or are ciliolate with the hairs spread along the sides or sometimes with a tuft of hairs at the apex. Since the scales are easily broken and their tips lost on most specimens, it is difficult to use this feature for identification. However, since the scales of different species may also be very different in form, size, and texture, they still are useful for distinguishing some species.

**Epidermis and stomata.**—The arrangement of the upper epidermal cells in the genus is uniform (*Fig. 10*). There are, however, mainly two types of stomata in the lower epidermis. Most are pericytic, with the stomata completely surrounded by a single subsidiary cell with guard cells and subsidiary cell not linked together by any anticlinal walls (*Figs. 9 and 11*). Some are polycytic, having the stomata in large part surrounded by a single, U-shaped subsidiary cell with the anticlinal cell walls of the guard cells and the subsidiary cell linked together toward the distal end. A few are desmocyctic or copericytic (Sen & Hennipman, 1981).

**Indument.**—There are four kinds of stellate hairs in different groups of *Pyrrosia*: the broad arm type has 6–9 lanceolate arms (*Fig. 12, a*), the acicular arm type has 8–12 acicular arms (*Fig. 12, b*), the dimorphic arm type has 6–9 lanceolate arms and 1–3 acicular arms (*Figs. 12, c and d*), and the crispate-lanose arm type has the arms crisped and intertwined like cotton velvet, mostly on the bottom layer of the dense, thick indument (*Fig. 12, e*). Hair types are a constant and reliable character for subdividing the genus.

### CONSPECTUS OF THE GENUS PYRROSIA

#### ***Pyrrosia* subg. *Pyrrosia***

TYPE: *Acrostichum lingua* Thunb. [= *Pyrrosia lingua* (Thunb.) Farw.]. 315

#### ***Pyrrosia* sect. *Pyrrosia***

TYPE: *Acrostichum lingua* Thunb. [= *Pyrrosia lingua* (Thunb.) Farw.].

#### ***Pyrrosia* ser. *Pyrrosia***

TYPE: *Acrostichum lingua* Thunb. [= *Pyrrosia lingua* (Thunb.) Farw.].

This is the largest series in the genus, with nearly 40 species, and is widespread in the Asian tropics and subtropics. Two species occur in Australia and one in Africa.

20108

20110

20013

**Pyrrrosia ser. Heteractides Ching & Shing, ser. nov.**

Pilis stellatis e brachiis lanceolatis necnon setis paucioribus (1-3) aciculatibus longioribusque compositis.

TYPE: *Polypodium heteractis* Mett. ex Kuhn [= *Pyrrrosia heteractis* (Mett. ex Kuhn) Ching].

This series includes only *P. heteractis*, which is found in southwestern China, Vietnam, and the Himalayan area, and *P. eberhardtii* (Christ) Ching, distributed in southern China and Vietnam.

20018

**Pyrrrosia ser. Drakeanae Ching & Shing, ser. nov.**

Pilis stellatis e brachiis 8-12 aciculatis compositis.

TYPE: *Polypodium drakeanum* Franch. [= *Pyrrrosia drakeana* (Franch.) Ching].

This series includes about 20 species from eastern Asia to southeastern Asia, with one species in Africa.

20019

**Pyrrrosia sect. Dichlamys Ching & Shing, sect. nov.**

Frons subtus indumento bistrato e pilis stellatis stipitatis dimorphis laxe composito praedita, superne e pilis aciformibus, et inferne e pilis lanosis crispatis compositis.

TYPE: *Niphobolus mollis* Kunze [= *Pyrrrosia mollis* (Kunze) Ching].

20020

**Pyrrrosia ser. Costatae Ching & Shing, ser. nov.**

Pilis strati superi e brachiis lanceolatis, inferi e filamentis lanosis crispatisque compositis.

TYPE: *Apalophlebia costata* Presl [= *Pyrrrosia costata* (Presl) Tag. & Iwats.].

This series includes, besides the type species, *P. nummularifolia* (Swartz) Ching and *P. strigosa* (Swartz) Ching; the species are limited to the Himalayas and southeastern Asia.

20021

**Pyrrrosia ser. Molles Ching & Shing, ser. nov.**

Pilis strati superi e brachiis longe aciculatis compositis, inferi crispatis lanosisque.

TYPE: *Niphobolus mollis* Kunze [= *Pyrrrosia mollis* (Kunze) Ching].

This series contains more than 20 species, with one in Africa.

20022

**Pyrrrosia subg. Niphopsis (J. Smith) Shing, comb. & stat. nov.**

*Niphopsis* J. Smith, Cat. Cult. Ferns 6. 1857. TYPE: *Polypodium angustatum* Swartz [= *Pyrrrosia angustata* (Swartz) Ching].

Rhizome thick, long-creeping, the scales caudate-lanceolate, grayish brown toward the apex and broken off in age, dark brown toward the persistent base; leaves fully dimorphic, the sterile blades shorter, lanceolate or elliptic-lanceolate, the fertile blades longer, linear-lanceolate or often narrowed to a linear apex; sori large, round or oblong, in a single series along the costae; spores bilateral, with many linear ridges, contracted at each end to an abrupt beak.

This subgenus includes two species distributed in southeastern Asia, Singapore, Malaya, Indonesia, and the Philippines to New Guinea and New Zealand. Morphologically this subgenus is advanced in the genus. Its perispore is similar to that of some species of *Dryopteris*. *Pyrrrosia samarensis* (Mett. ex Presl) Ching has the same spore ornamentation as *P. angustata*, but its sterile leaf is narrower and its sori are confluent at maturity. Its laminae bear many, dark brown, stellate hairs with aciculate arms covering the hairs of the basal layer of indument, which are of the crispate-lanose type. This species is endemic to the Philippines.

## NEW COMBINATIONS IN PYRROSIA

According to my studies, the following species require names in *Pyrrosia*:

***Pyrrosia dispar* (Christ) Shing, comb. nov.**

*Cyclophorus dispar* Christ, Nova Guinea 8:155. 1909.—New Guinea.

***Pyrrosia intermedia* (Goy) Shing, comb. nov.**

*Cyclophorus intermedia* Goy, Queensl. Nat. 10:48, t. 6. 1937.—Queensland.

***Pyrrosia macrocarpa* (Copel.) Shing, comb. nov.**

*Cyclophorus macrocarpa* Copel. Univ. Calif. Publ. Bot. 12:381. 1931.—Pacific Islands.

This species is somewhat similar to *P. angustata* in outline, and Christensen (Ind. Fil. Suppl. 3:65. 1934) reduced it to a variety. It differs from *P. angustata* in that the plants are smaller, the spore ornamentation is closely tubercular (Fig. 2), and the sori are never impressed. It is found only in several islands of the Pacific, such as the Cook Islands, Pitcairn Island, and the Austral Islands.

***Pyrrosia distichocarpa* (Mett.) Shing, comb. nov.**

*Polypodium distichocarpum* Mett. Ann. Lugd. Bat. 2:231. 1866.—Sumatra.

*Cyclophorus winckleri* Rosenst. Repert. Sp. Nov. Fedde 7:149. 1909.—Sumatra.

*Pyrrosia winckleri* (Rosenst.) Tagawa, Acta Phytotax Geobot. 25:180. 1973.

*Pyrrosia winckleri* and *P. distichocarpa* are here united for the first time. I have seen several specimens of the latter species, but no type material.

***Pyrrosia borneensis* (Copel.) Shing, comb. nov.**

*Cyclophorus borneensis* Copel. Phil. J. Sci. 12C:64. 1917.—Borneo.

***Pyrrosia rasamalae* (Racib.) Shing, comb. nov.**

*Polypodium rasamalae* Racib. Pterid. Buit. 99. 1899.—Java.

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